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SCIENCE

FRIDAY, FEBRUARY 8, 1918

CONTENTS

The American Association for the Advancement of Science:—
The Future of Agricultural Education and Research in the United States: PROFESSOR WHITMAN H. JORDAN 125

Scientific Events:—
Committee on the British Chemical Trade; Iron Ore in 1917; The Fisheries Conference; Medical Training Camps 134

Scientific Notes and News 138

University and Educational News 141

Discussion and Correspondence:—
Cycadoid Wood Structure: DR. G. R. WIELAND. *The Relation between Age and Area in the Distribution of Plants:* E. F. ANDREWS. *Origin and Development of the Photogenic Organs of Photuris Pennsylvanica:* DR. WALTER N. HESS. *Joseph Young Bergen:* PROFESSOR EDWIN H. HALL 141

Scientific Books:—
The Caster-Counter and the Counting-Board: PROFESSOR DAVID EUGENE SMITH. *Jones on the Nature of Solutions:* PROFESSOR WILDER D. BANCROFT 144

Special Articles:—
Comparative Permeability of Fertilized and Unfertilized Eggs to Water: PROFESSOR RALPH S. LILLIE 147

The American Society of Naturalists: PROFESSOR BRADLEY M. DAVIS 149

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THE FUTURE OF AGRICULTURAL EDUCATION AND RESEARCH IN THE UNITED STATES[1]

EDUCATION and research in the interests of agriculture have become important factors in the daily thought and activities of this nation. Those of us who saw the beginnings of the great educational movement which had its inception during the Civil War now contemplate its magnitude and influence with a feeling akin to that of amazement. More than one hundred land grant colleges and agricultural experiment stations are now in active operation, which were manned under pre-war conditions by over 7,000 administrative officers, teachers and investigators, using a combined income of over twenty-five million dollars and instructing between forty and fifty thousand students, besides carrying on extensive lines of research. More than all this, as a by-product of the Land Grant Act of 1862, a great system of popular education has been organized and Farm Bureau agents and extension teachers are now in touch with a large majority of our farming people.

This new movement in education, generally spoken of as vocational, which was regarded in its earliest days as a dangerous innovation, has not only attained a remarkable development, but has without question exercised a modifying influence over the educational policy and methods of the older universities and colleges.

That these institutions have performed

[1] Vice-presidential address before Section M. American Association for the Advancement of Science.

an indispensable function in our educational system is now generally conceded. They are now firmly imbedded in our governmental policy and receive an almost unanimous support.

Notwithstanding all this we are now questioning concerning the future of agricultural education and research. Are these efforts so directed as to most fully serve public welfare? Will the ideals which have dominated them and the aims to which they have been directed in the past meet future needs? Do the shafts of ridicule, often directed at what has been termed mind culture, and the insistent assertion that education fails to meet modern needs unless it serves some practical end, proceed out of a sound philosophy? Maintained as these colleges and stations are under a popular form of government and subject to the reactions of political changes and the vagaries of the public mind, do we see any indications that their efficiency is menaced? Existing as they do, in what we sometimes fondly call a democracy, will education and research in the interest of agriculture develop the high standards of efficiency that are reached by privately endowed institutions?

The fact that the agencies in question have developed to great magnitude does not spell efficiency as directed to given ends. Efficiency in education and research depends largely upon factors not measurable in terms of extensive equipment, large faculties or great bodies of students.

The question of the permanency of the agricultural colleges and experiment stations need not arouse solicitude. The teachings of these institutions are too firmly embedded in agricultural thought and practise, and the rural people are too dependent in technical and difficult matters upon the body of knowledge that has been, and is still being, developed, for their guidance to permit even a suggestion that agencies so useful will be allowed to lapse or lessen their activities. It must be conceded, too, that our experiences during the past two years have strengthened the confidence of the people in the colleges and stations. We can not fail to be impressed by the fact that a large number of men and women have been trained in these institutions to perform exactly the service now demanded in maintaining and directing our agricultural resources. It is gratifying to note also that many positions of responsibility in relation to food production and conservation are filled by graduates of the colleges of agriculture.

More than this, the large body of knowledge that has been collected and organized, which relates fundamentally to crop production and to the defense of the farmer and fruit-grower against the ills which beset them has greatly strengthened our grasp of the questions related to food production and conservation at a time when our resources are under a severe strain. Without these trained men and women and the knowledge gained through investigation and instruction in the interests of agriculture, it is difficult to understand how we could meet as successfully as we are doing the tremendous problems imposed by the war. We need not fear, then, that agricultural education will take a lesser place in our national life, but rather we may expect it to develop to meet larger needs, provided it is wisely directed.

The problem which should have our most careful thought and consideration is that of efficiency as related to the real functions which the colleges and stations should perform. As has been suggested, an elaborate physical equipment, generous endowments and subsidies, extensive laboratories and crowded classrooms—even

popular approval—do not of themselves indicate a wise educational policy. The great essentials of educational efficiency are intangible, and are found in the aims toward which the organization and activities of the colleges and stations are directed. In the case of state-supported institutions efficiency may also be promoted or hampered in a large measure by the conditions which are created through legislation and through the rules and regulations of related administrative departments, whether national or state.

Before proceeding further in our discussion, let us bring before our minds some of the essential purposes of agricultural education and research and the conditions that should be established within the institutions concerned, in order that this great national adventure in education, so generously endowed from public funds, shall not attain less than the largest possible results.

Without doubt, we can all agree to the statement that agricultural education and research should include in their scope fundamental purposes common to all education and research. No attempt at education in any direction is worthy of a place in our civilization which does not intensify in the individual a sense of his obligation to promote public welfare, elevate his moral and intellectual quality and in so doing enlarge his life opportunities and increase his efficiency for community service and individual attainment. No research is worthy of support that is superficial and trivial and in failing to arrive at fundamental truth and sound conclusions establishes an unsafe basis for practise. This means that agricultural education and research must be dominated by the ideals, infused with the spirit and strengthened by the conditions, that past experience has shown to be essential to the advancement of knowledge and to the training of young men and women for the largest usefulness. The subject-matter and the tools of education and research may change, but the point of attack of the teacher and investigator should be the development of patriotic impulse, sound knowledge, elevated human character and individual efficiency and through these results promote human welfare. The influence of education is reflected chiefly in its product of truth and trained minds.

It is for these reasons that some of us hold that the great and insistent problems of the colleges of agriculture are not primarily related to institutional participation in the social and economic reorganization of rural communities, but are concerned first of all with the training of young men and women. It is a serious question whether these colleges have not expended energy and means in educational propaganda which could more wisely have been applied to increasing internal efficiency. There are many reasons for holding that community life will reach a sound and enduring social and economic status only when its progress is self-initiated and self-directed and possibly we shall some time discover that this very laudable impulse on the part of institutions to be of public service has been carried too far in attempting to impose rapidly upon the rural people conditions that can only be reached through that gradual education and development attained in no other way than through community effort.

The avenue through which agricultural education and research will react upon community life most effectively will not be elaborate platform and literary propaganda, but the continual personal contact of the people with minds adequately trained for leadership. If this be so, then the product of the colleges should be leaders. Do you say this is obvious? Grant-

ing that it is, we may now inquire as to the directions in which leadership is most needed.

When the land grant colleges first came into existence, the thought forced to the front, which has gripped the public mind ever since, was that agricultural education had for its function growing the extra blade of grass through the enlarged vocational efficiency of the farmer. Directed by this conception of its main purpose, the college of agriculture has in many instances been severely commercialized. Because of the changes that have arisen in our social and economic conditions and the increase of agencies established for the promotion of agricultural progress, the time has now come when we must ask the question whether the ultra-practical point of view so widely prevalent among agricultural teachers is the one that will fully meet the developing situation.

We are obliged to abandon the notion, if we ever held it, that these colleges will train within their walls any large proportion of the men and women that will live on the land. On the other hand, we must take practical cognizance of the fact that the by-products of the college, such as agriculture in the high schools, extension teaching and farm bureaus, are the agencies that are now touching farmers and farm homes in a more intimate way than was ever possible by the college and are accomplishing much that in earlier days the college was expected to do. There is now an unfilled demand for the highest type of leadership in these and other directions. This leadership, if it satisfies the demands that confront it, must be much more than merely technical and vocational. The future of the rural people is now greatly concerned with factors other than larger production.

It is increasingly evident that the social environment of the farm and the broad economic conditions to which the farmer is now related, in the determination of which he must be a factor, must now receive major attention. It is not exaggeration to declare that the social organization of a rural community and the extent to which farmers successfully meet competing interests are now determinative factors in agricultural welfare and progress. The educational policy which is concerned chiefly with the problems of larger and cheaper crops will come far short of meeting the situation adequately. If these colleges of agriculture are to aid in developing men capable of the needed leadership, must they not lay the foundation in their graduates for the intelligent and successful consideration of the broad questions relating to rural sociology and economics? Should not these graduates become leaders of thought in all that pertains to community welfare and progress? The question then is, Do a majority of the colleges of agriculture adequately provide training of this type?

Having outlined a type of leadership now demanded for agricultural progress, we may now consider what should be the policy of the colleges of agriculture as related to the subject-matter of the courses of study and to the point of view established in the minds of the students through contact with their teachers. There has been more or less prevalent what some of us regard as a convenient fallacy, comforting, perhaps, to those who cater to popular notions as to what is practical in education, that a study of the sciences as applied to the various phases of agricultural practise and engaging the mind with such ultra-practical subjects as judging corn or cattle, making butter and cheese, orchard culture or poultry keeping, completes the round of the training essential to the agricultural college graduate and that in the interests

of vocational efficiency the severer ranges of thought involved in the study of the fundamental sciences, mathematics, economics, civics, psychology, language and literature should be reduced to a minimum. Can any one of us who has traveled the academic road and recalls the varying reactions upon his intellectual vision and equipment of the several subjects which engaged his attention as a student believe this is the needed training for such leadership as is demanded? Ask graduates from ultra-practical courses of study who have entered the service of a college or station, or who have attempted leadership in a rural community, how they regard this matter and you will get enlightenment from those whose experience justifies an opinion as to the adequacy of their undergraduate training. They will tell you, as many of them have told others, that they are called upon to enter into ranges of thought and to meet problems for which the college did not even lay the foundation of an adequate preparation.

Insistent questions arise just at this point. Can we reasonably speak of vocational efficiency or efficiency in any direction as apart from intellectual efficiency? Are technical expertness and practical facts a substitute for the development of the reasoning powers and the establishment of a sound basis on which to rest conclusions? For the future citizen, will the ability to judge a steer take the place of ability to judge a political candidate's civil and political theories? As a factor in the economic success of a rural community, will a knowledge of fertilizers take the place of wise plans for the disposal of the crops produced? For a human being whose life will be less than a success if he accomplishes nothing more than vocational prosperity and does not enter effectively into the problems of community welfare, which is worth the most—ability to think clearly concerning human conduct and relations or mere expertness in farm management? Is anything a substitute for the development of high ideals of conduct and a clear understanding of human relations? In short, what are the major objects of human living and in what way can education serve these? Is the educational policy of our land grant colleges sufficiently directed toward the larger issues of life? Is it not entirely possible that the education provided at these institutions has become too material and commercial, and that we need to pause and consider whether vocational success without human efficiency is a result greatly to be desired? These are questions for serious thought and they now demand our attention.

If we accept the view, as obviously we must, that the mentality of a man or woman is a dominating factor in his or her human value and individual success, then we should carefully scrutinize the relation of the subject-matter of the college classroom to the development of intellectual acumen and vision. We may make a grievous error if we too fully abandon what is termed the cultural point of view in education and fail to nourish the intellect and to establish with our graduates a basis for correct and sound thinking regarding the broad relations of life. It will be a fatal error if we allow the demand for commercial advantage to cause us to ignore the need for soul and mind culture. Should we not, therefore, revert to some extent to the older and somewhat abandoned point of view held by the earlier educators that the function of the college is to establish with the student not so much a mass of facts as the ability to deal with facts?

Putting these questions in another form, we ask whether the ultra-practical course of study is not a mistake and whether the

college that retains to the largest possible degree an association with the fundamental sciences—those subjects traditionally spoken of as the "humanities"—especially those relating to social and economic conditions is not pursuing a wise policy? Some of us are convinced that conditions of expediency, based on popular demand, have led the agricultural colleges too far afield in what has been termed practical training.

At this point it may be asked, from whence shall come specialists for teaching and investigation in the fields of agronomy, agricultural biology, horticulture and animal husbandry if not from the agricultural colleges, and would not the injection into the curriculum of a larger proportion of the so-called general culture studies crowd out much that is essential to the technical courses and defeat, in part, the objects for which the colleges were created?

This question suggests others. In practise are the graduates from the prevalent agricultural courses found to be fitted to teach or investigate? Do they not soon discover, or at least, do we not discover for them, that the higher ranges of service, whether in the classroom, laboratory or in the field, demand broader and deeper vision than they possess, which must be acquired through a subsequent severer and more extensive training? Are we not in many instances turning to the graduates from the older universities for members of college faculties and station staffs? Why not then give to the student a broad educational foundation, with special attention to some line of science applied to agriculture and make him understand that to be a capable teacher, investigator, publicist, or even the most useful member of a rural community, all this and more is required. We should not be satisfied to bring into contact with our students or accept in our station staffs men and women who are mere specialists and whose influence over the student's mind and in the station community ceases with imparting or gaining a knowledge of certain practical facts. Because the value to young men or women of their college experience arises to a great extent from their contact with teachers of broad vision, large understanding and an active sympathy with life problems, we should adequately prepare the teacher for this high function and great responsibility.

But you ask, what about the young men and women who go from the college to the farm and farm home? Considering the kind of service now demanded in rural communities, the need for leadership guided by the ability to reason from fundamental facts and principles and by an understanding of social and economic relations, is far greater than the need for mere expertness in fertilizing the land, feeding animals or spraying fruit trees, howsoever important these may be. For this reason let us train at least some young men and women to meet this need even if they must learn through postgraduate experience certain practical facts to which an ultra-practical course of study would give attention. To-day the human problems are the big problems. On its social and economic environment the future of the farm largely rests, and the average rural community sadly lacks leadership that is something more than vocational. In brief, then, the agricultural colleges should not establish entrance requirements and curricula chiefly with reference to turning out practicians, but should give prominent consideration to training men and women for effective agricultural leadership. Such men and women, inspired by a zeal for service, are needed in our legislatures, even in our national legislature; they are needed as publicists and in close and constant

touch with the life of rural communities.

So far we have discussed some of the aims to which it is argued the agricultural college should direct its attention. Let us now consider the aims of the experiment station. If asked what they are, we might answer with the brief phrase—scientific research in the interests of agriculture. No answer is adequate, however, which does not include an interpretation of the term research. Should this interpretation be based upon the projects undertaken by experiment stations, we would surely arrive at a state of perplexity for it would include everything from severe laboratory inquiry to loosely conducted experiments having no possible outcome other than an answer to narrow business questions, possibly only local in their scope.

If the members of this Section now expect to hear a criticism of the past, they will be disappointed. It is much wiser to consider future efficiency, because in former discussions the mistakes of the past have been laid bare. Many of them were almost inevitable mistakes, incident to the rapid development of a new effort, especially under the coercive influence of public expectancy reacting upon legislative attitude. May we not, however, be permitted to indulge in criticism having a constructive purpose even though nothing new in the way of suggestion be offered.

The decision as to whether an alleged scientist is conducting research worthy of the name should depend upon the method or plan under which he is working and the quality of the effort applied to the problem and not upon the title of the project. An experiment station may state that it is studying problems of soil fertility, but if it is doing this merely by means of field experiments directed to determining the relative profit from different methods of culture without at the same time studying as exhaustively as possible some one or more of the biological, chemical or physical factors contributing to the result but little or no real progress will be made. Our understanding of animal nutrition has not been the result of practical feeding experiments to any important extent but has developed out of studies of metabolism with the respiration apparatus and other refined methods. Instances of the futility of ultra-practical experiments as a means of arriving at basal facts and principles could be cited in great number.

One suggestion that reasonably applies to the whole range of agricultural research and which if followed more generally would undoubtedly result in greater investigational efficiency, is that experiment stations should confine their studies to the narrow individual factors that are involved in agricultural production rather than driving directly at broad generalizations or answers to business problems which include the operation of many factors. The history of agricultural science shows clearly that only in this way has substantial progress been made.

In discussing the efficiency of agricultural research in the United States our attention should not be confined wholly to the experiment stations but should also be directed to the largest single effort of this kind now supported by public funds. Doubtless what will now be said will be taken as a criticism and it is intended as such, not of individuals but of a situation which has grown up under what must be regarded as a mistaken policy. Reference is made to activities in the Federal Department of Agriculture classified as agricultural investigation that occupy the time of a large number of men and against which are charged annually millions of dollars of expense. While it is recognized that this department has made many

worthy contributions to agricultural science, it may safely be asserted that the conditions under which the scientific efforts of the department are conducted are not those which most fully inspire and nourish the research spirit or permit the most effective and economical application of time and energy to the study of problems. This is due to the fact that many of those persons who are expected to be fruitful in scientific results are so inextricably entangled with the distractions attending propaganda and administrative duties that the essential repose of mind, opportunity for study and reflection and continuity of effort, are not possible. The opinion is entertained by those familiar with the situation that until research efforts supported by, and maintained within, the Federal Department of Agriculture are separated from their present environment we may not expect the most efficient application of thought and energy to scientific studies.

So far we have dealt chiefly with questions of the internal policy of the agricultural colleges and experiment stations. Let us now turn to a consideration of the influence of certain external conditions of the nation and states.

A movement has developed during the past few decades which is of great significance to national and state-supported institutions and is regarded by those who have come under its domination as a menace to the efficiency of agricultural education and research. Reference is made to the marked tendency toward the centralization of directive authority over institutions maintained by public funds. It is evidently being assumed that greater efficiency and economy of energy and funds will result if upon the management of such institutions is superimposed through the authority of a department, bureau or commission, national or state, control that is essentially administrative in character. Evidently it is now assumed that it is more or less dangerous to leave with the management of certain national or state-supported institutions the liberty heretofore regarded as essential to successful administration, especially of education and research. In a few states where this movement is most marked, administrative officers have come to speak of themselves as "rubber stamps." The officers of certain of our colleges and stations surely must realize that they have lost their official autonomy to a considerable degree and that they should not be regarded as wholly responsible for the policy and conduct of the institutions over which they have charge. Is there any justification for this? Does it arise in the conviction that the colleges and stations have adopted wrong policies, employed incompetent men or wasted public funds? So far as can be discovered, it does not originate in charges of this nature.

Before discussing this situation in detail, let us outline what are the conditions essential to the successful direction and maintenance of education and scientific research. It is generally agreed that these are freedom of administrative initiative, such organization and relations as are stimulating both to the teacher and to the research worker and the possibility of maintaining a continuous policy in the conduct of any institution that is organized for the purposes named. A college or station must have a staff of workers, and its management should be at liberty to employ and develop this staff without let or hindrance within the limits of its financial resources. No regulations should be imposed which prevent the retention of satisfactory service on a salary basis consistent with the costs of living or which makes it impossible to meet in a reasonable way the competition for efficient teachers and in-

vestigators which is now so keen. These institutions must have funds, but they should be provided under regulations which do not constitute a barrier to the accomplishment of the ends for which they are established.

The relation of the federal government to the agricultural colleges and experiment stations which it is subsidizing has been the subject of much discussion and the occasion of more or less anxiety on the part of state officials. The congressional acts making possible the establishment of the land grant colleges, whether the first Morrill Act donating public lands to the several states or later acts making appropriations of money, placed few restrictions upon the several states accepting the terms of these acts. Each state has been allowed to organize and develop its college of agriculture without outside interference and while mistakes have been made and the expenditure of funds has been more or less wasteful, the result has been that these institutions have been developed and adjusted in accordance with the needs and conditions of the states in which they were located. It is probable that had the federal government attempted a centralized direction of this new enterprise the results would not have been as satisfactory as those which have been reached.

The original legislation establishing agricultural experiment stations and the acts subsequent thereto materially increased federal supervision. This is especially true of the terms under which the appropriations made by the Adams Act are applied to agricultural investigation. The Department of Agriculture requires not only that the various projects which the institutions propose to undertake shall be filed with the department for its approval, but it inspects the work and accounts of the several experiment stations to determine whether the funds have been expended in accordance with the enabling act and solely for the study of the projects which have been filed. No fault can be reasonably found with the attitude of the federal government in ascertaining whether or not the money it appropriates is properly and legally expended, and there appears to be no disposition to chafe at the supervision now exercised by the national Department of Agriculture over the use of what are known as the Hatch and Adams Funds.

Later legislation, known as the Smith-Lever and the Smith-Hughes Acts, providing respectively for the extension of agricultural knowledge in a popular way among the people and for industrial education in our secondary schools, requires still closer supervision of the use of federal funds and of the plans proposed by the several states for the carrying out of these efforts. It is in these latter acts that federal supervision is regarded by many as having approached the danger point. This anxiety has been caused not so much by what is now the federal policy as by the future possibilities under the provisions of the acts named. It is felt that the direction of these educational efforts should have been confided more fully to the several states, other than a proper auditing of the expenditure of funds, and that too much leeway is given to the individual judgment of federal officials. There is certainly danger from more or less loosely defined directive authority that a governmental department or bureau may exercise, whether state or national, over education and research because our political system makes possible frequent changes in administrative staffs, and the maintenance of a consistent and uniform policy is thus endangered.

It is not intended in what is being said to criticize individuals, but to call atten-

tion to the dangers under our form of government of centralizing authority in departments or bureaus distantly located, and necessarily not closely informed concerning the institutions over which they may exercise supervision.

The situation in some of our states is an occasion for real alarm, for what is known as the budget system now threatens the efficiency of agricultural education and research. Undoubtedly such a system should be applied to the financing of the nation, the states, public utilities and even private enterprises, but a fiscal policy may be carried to such an extreme that it becomes burdensome and even tyrannical and defeats its own objects. To illustrate: in certain states legislative budget committees fix salaries for the various positions in the colleges and stations and establishes an expense budget for these institutions segregated into numerous items, and no deviation is allowed from either salary or expense items, no matter what exigencies may arise. As a rule, the members of these committees have no intimate knowledge of the operations of the institution with whose interests they are dealing and on the basis of a hasty judgment not fully informed may establish salaries and expense items in such a way as to greatly hamper institutional progress. It is absurd for a college president or the director of a station when taking on a new man at a low salary to be unable to give him any assurance that continued efficient service will result in improving his financial status. It is even more absurd if a call to go elsewhere is given to some member of a teaching or investigational staff for the president or director to be unable to retain his services when it would be economical and wise to do so by the addition of a few hundred dollars to his salary. It is perplexing, sometimes embarrassing, and sometimes the occasion of vigorous language, for an institution to have its work set to a fixed financial scheme which does not fit the demands upon it. No prophets, ancient or modern, were ever called upon for a more difficult task than the filing of a statement with a legislative committee as to just how much money will be needed for traveling expenses twelve months in the future or how much it will cost to maintain a herd of cattle or run an automobile.

Those of you who are abiding in peace and comfort with a broadly segregated budget as, for instance, a lump sum for salaries and a lump sum for expenses, may think that these somewhat strenuous remarks concerning centralized control and an embarrassing bureaucracy are out of place. You should be assured, however, that this budget infection is spreading and that when one state adopts a new fiscal scheme other states are inclined to fall in line. Do not rest too quietly in your present liberty. The time may come when over yourself will be your board of control, and over your board of control a bureau, and over that bureau a committee, and over that committee the legislature, each division of authority feeling the responsibility of directing subordinate interests. There is every reason to fear that if present tendencies toward the closer control of our agricultural and research institutions by committees and bureaus is not checked, efficiency in education and research will abide only with privately endowed institutions.

Whitman H. Jordan

SCIENTIFIC EVENTS

COMMITTEE ON THE BRITISH CHEMICAL TRADE

The committee appointed by the Minister of Reconstruction to advise as to the procedure which should be adopted for dealing with the

chemical trade has now concluded its deliberations and issued its report, the following account of which is given in *Nature*. The committee was appointed (1) to advise as to the procedure which should be adopted by the Minister of Reconstruction for dealing with the chemical trade; 2 to consider and report upon any matters affecting the chemical trade which could be more effectively dealt with by the formation of special organizations for the purpose, and to make suggestions in regard to the constitution and functions of any such organization.

The members of the committee are: Sir Keith W. Price (chairman), Mr. John Anderson, Mr. J. F. L. Brunner, Dr. Charles Carpenter, Professor J. G. Lawn, Sir William Pearce, Mr. K. B. Quinan, the Right Hon. J. W. Wilson, and Mr. G. C. Smallwood (secretary). The committee says that it is evident that during the process of reconstruction numerous difficult problems and questions are likely to arise in connection with the chemical trade. The committee is of opinion that these can be satisfactorily settled only by the closest collaboration between the Minister of Reconstruction and the representatives of the trade, and it appears to be necessary that the minister should be in a position to obtain the views both of the trade as a whole and, in the case of particular problems, of that branch of the trade directly concerned.

This end could probably be attained in a satisfactory manner if there were in the chemical trade a representative body, which could advise the minister and act in a consultative capacity on chemical matters. Such a body should be fully representative of the whole of the trade, and the difficulty of the committee lies in naming an association which could be said completely to fulfil this condition.

The committee is of opinion that, in dealing with the chemical trade, the Minister of Reconstruction could properly act in collaboration with the Association of British Chemical Manufacturers. It is further of opinion that with a view to convenience of practical working, and in order to establish the permanent link which should exist between the ministry and the trade in all its branches, a standing committee should be established fully representative of all the interests concerned.

As to points of reference No. 2, the opinion is expressed that whatever may be the functions of the Ministry of Reconstruction, it will be necessary to establish a section of that department which will be in a position to deal with matters which may arise in connection with the chemical trade. The appointment to the Ministry of Reconstruction of a scientific man of good standing, who would command the respect and confidence of the trade, together with the necessary staff, is suggested. This section, working in conjunction with the standing committee previously mentioned, would provide the Minister with an adequate organization for dealing with such questions connected with the chemical trade. The following would represent some of the duties of this section:

(1) To ascertain with the assistance of the standing committee the chief problems which are likely to arise in the process of reconstruction after the war, and the best means of dealing with them. (2) To survey generally the chemical trade, both at home and abroad, and in consultation with the standing committee to afford advice for the broadening and improvement of the chemical trade of this country. (3) To collect and disseminate information on, and statistics of, the chemical trade. (4) To collect and collate as much information as is available on the work which has been done during the present war, which would, no doubt, be of great interest and assistance to the chemical trade as a whole.

The committee states in the report that it has confined its recommendations within the narrow limits defined by the terms of reference, which speak only of "chemical trade." If, however, for that expression were substituted "the national chemical industry," a much broader purview would be involved, and specific reference would be necessary to existing organizations other than those specifically founded for "trade" purposes, among which may be mentioned: The Society of Chemical Industry, the Government Laboratory, the

Committee of the Privy Council for Scientific and Industrial Research, the Imperial Institute, the National Physical Laboratory, and the Chemical Society.

It is recommended:

1. That in dealing with the problems of the chemical trade action should be taken so far as possible in the closest collaboration with representatives of the trade.

2. That the Association of British Chemical Manufacturers should be considered as representative of the chemical trade as a whole with certain branches excepted.

3. That a standing committee should be appointed. This committee, which should be fully representative of all the interests concerned, would establish a permanent link between the Ministry and the trade.

4. That a departmental organization should be set up in the Ministry of Reconstruction to deal with chemical questions.

IRON ORE IN 1917

The iron ore mined in the United States in 1917 amounted to about 75,324,000 gross tons, compared with 75,167,672 tons in 1916, an increase of 0.2 per cent. The figures for the two years are so nearly the same, however, that when the final returns are received from all the producers the actual quantity mined in 1917 may prove to have been less than that mined in 1916. The shipments from the mines in 1917 are estimated at 75,649,000 gross tons, valued at $236,178,000, compared with 77,870,553 tons, valued at $181,902,277 in 1916, a decrease in quantity of 2.9 per cent., but an increase in value of 29.8 per cent. The general average value of the ore per ton at the mines for the whole United States was therefore $3.12 in 1917, as compared with $2.34 in 1916. The stocks of iron ores at the mines apparently decreased from 10,876,352 gross tons in 1916 to 10,560,000 tons in 1917, or 2.9 per cent.

To obtain these statistics preliminary figures received from producers of nearly 95 per cent. of the normal output of iron ore were compiled under the direction of Ernest F. Burchard, of the United States Geological Survey, Department of the Interior, and were supplemented by estimates covering the remainder of the output.

About 85 per cent. of the ore mined in 1917 came, as usual, from the Lake Superior district, which mined about 63,964,000 gross tons and shipped 64,275,000 tons, these quantities representing a very slight increase and a decrease of 3.2 per cent., respectively, compared with 1916. The shipments of iron ore by water from the Lake Superior district, according to figures compiled by the Lake Superior Iron Ore Association, amounted in 1917 to 62,498,901 gross tons. It thus appears that the iron-mining industry in the Lake Superior district has been able to bear the strain of the war demand but not to duplicate the great record of ore shipments made by the district in 1916, which amounted to 64,734,198 gross tons. The slight falling off, it is understood, was due to less favorable weather for shipping early and late in the season of 1917 rather than to inability of the Lake fleet to handle the ore mined.

The South mined and shipped more than 8,100,000 tons of iron ore, the bulk of which was produced in the Birmingham district, Ala., but the iron mines of Georgia, Tennessee, North Carolina, and Virginia contributed about 1,400,000 tons to the total.

The Northeastern States—New Jersey, New York, and Pennsylvania—increased their production slightly as compared with 1916 and shipped to blast furnaces approximately 2,446,000 tons of ore. This quantity, however, represented decrease of 4.1 per cent. as compared with the shipments in 1916.

Colorado, New Mexico, and Wyoming, the principal iron ore producing States in the West, are estimated to have mined and shipped approximately 666,000 tons of iron ore, compared with 717,660 tons in 1916, a decrease of 7.2 per cent.

Other States, such as California, Connecticut, Iowa, Maryland, Massachusetts, Missouri, Nevada, Ohio, Utah, and West Virginia, in which there are small iron-mining operations, are estimated to have shipped about 144,000

tons of ore, compared with 134,002 tons in 1916, an increase of 7.5 per cent.

The imports of iron ore for the eleven months ending November 30, 1917, according to the Bureau of Foreign and Domestic Commerce, Department of Commerce, amounted to 913,500 gross tons, so that probably the imports for the whole year reached 988,500 tons, compared with 1,325,736 tons in 1916.

THE FISHERIES CONFERENCE

THE members of the Canadian-American Fisheries Conference held recently in Washington, were received by the President at the White House on January 22, 1918. The President expressed great satisfaction at the cordial and friendly spirit which had manifested itself during the continuance of the conference. The following gentlemen were presented to the President by Hon. William C. Redfield, secretary of commerce and chairman of the conference: Hon. J. Douglas Hazen, chief justice, of New Brunswick; Mr. George J. Desbarats, deputy minister of naval service, and Mr. William A. Found, superintendent of fisheries, of the Canadian delegation; Mr. Edwin F. Sweet, assistant secretary of commerce; Dr. Hugh M. Smith, commissioner of fisheries, of the American delegation; Mr. Arnold Robertson, first secretary of the British Embassy, and Mr. Maitland Dwight, of the department of state, secretaries of the conference.

The conference held eight sessions and made satisfactory progress toward reaching an arrangement suitable to all concerned. Among the questions discussed were the following:

The protection of the salmon in and around the Fraser River; the protection of the halibut, which has been overfished, the center of this industry being Seattle, Vancouver, Prince Rupert and Ketchikan, on the Pacific; equitable rules governing the use of Canadian and American ports by the fishing vessels of both countries, however propelled; the lobster fisheries of the Atlantic; pike-perch fishing in Lake Champlain, and the possible passage of rules relating to the whale industry.

The conference is looking forward to the privilege of consulting the fishing interests at the hearings which it is proposed to hold in New England and in the maritime provinces of Canada in the near future. It is also proposed to visit the Pacific coast, and it is hoped that these hearings will throw some light on the subject with a view to a satisfactory settlement being reached.

The whole conference is desirous of establishing the present law and practise as regards the fish industry, and believes that with this as a basis a satisfactory conclusion may be attained.

The Canadian delegates extended an invitation to the American delegates to visit Ottawa some time before the conclusion of the conference.

MEDICAL TRAINING CAMPS

EXTENSIONS are being made to the scope of the medical training camps at Fort Oglethorpe, Ga., and Fort Riley, Kans., by the addition of courses in specialties required of the Medical, Sanitary and Veterinary Corps under Surgeon General Gorgas. There are at present 5,400 officers and men under training at Fort Oglethorpe and 3,800 at Fort Riley. Fort Riley has a capacity of 7,000. Enlargement of the school at Fort Oglethorpe to the same capacity has been authorized, its present capacity being 5,500. The ultimate needs of the Medical Department of the Army look to training camps of capacities totaling 35,000 to 40,000 officers and men.

There have been graduated from medical training camps since June 1, or are now under instruction, a total of about 9,000 officers and about 20,000 enlisted men. Until December 1 the medical training camp at Fort Benjamin Harrison, Ind., and the one at Fort Des Moines, Iowa, for colored officers and men, had been contributing to the total, but these camps have been discontinued.

Ten new sections have recently been or are now being established for officers in the medical training camps. These are for the following:

(1) X-ray specialists; (2) orthopedic surgeons; (3) psychologists; (4) special examining surgeons; (5) sanitary engineers; (6)

veterinarians; (7) sanitarians; (8) hospital administration; (9) laboratory specialists (being established); (10) dental surgeons (being established).

Consideration is being given to plans for the establishment of three additional courses, one in general military surgery, one for genito-urinary surgery, and one for military surgery of the brain, head and face.

Various special groups now in active service have been trained since the opening of the schools. These include officers and men to operate ambulance companies, field hospitals, evacuation hospitals, base hospitals, hospital trains, etc.

SCIENTIFIC NOTES AND NEWS

Professor Fridtjof Nansen, of the University of Kristiania, Norway, now in Washington as Minister Plenipotentiary of Norway on special mission to the United States of America, has been elected an honorary member of the Washington Academy of Sciences. Dr. Nansen on January 31 gave an address before the academy on "Changes in oceanic and atmospheric temperatures and their relation to changes in the sun's activity."

Frank Austin Gooch, Ph.D., professor of chemistry and director of the Kent Chemical Laboratory of Yale University, will retire at the end of the present year. Professor Gooch will be succeeded by Professor Bertram Borden Boltwood, since 1910 professor of radio-chemistry.

At the meeting of the Ecological Society of America in Pittsburgh, officers for 1918 were elected as follows: *President,* Dr. Henry C. Cowles, University of Chicago; *Vice-president,* Dr. Robert E. Coker, Bureau of Fisheries, Washington, D. C.; *Secretary-treasurer,* Dr. Forrest Shreve, Desert Laboratory, Tucson, Ariz.

Dr. E. M. Freeman, dean of the college of agriculture of the University of Minnesota, was elected president of the American Phytopathological Association at the Pittsburgh meeting.

The officers of the Washington Academy of Sciences for 1918 are as follows: *President,* Lyman J. Briggs, of the Bureau of Plant Industry; *Corresponding secretary,* Robert B. Sosman, of the Geophysical Laboratory; *Recording secretary,* W. R. Maxon, of the National Museum; *Treasurer,* William Bowie, of the Coast and Geodetic Survey; *Non-resident Vice-presidents,* T. A. Jaggar, Jr., of Hawaii, and B. L. Robinson, of Cambridge; *Members of Board of Managers,* T. H. Kearney and A. C. Spencer; *Vice-presidents* representing the affiliated societies: G. K. Burgess, Philosophical Society; J. R. Swanton, Anthropological Society; J. N. Rose, Biological Society; T. H. Kearney, Botanical Society; F. B. Power, Chemical Society; W. D. Hunter, Entomological Society; O. H. Tittmann, Geographic Society; W. C. Mendenhall, Geological Society; P. S. Roy, Medical Society; A. C. Clark, Historical Society; A. Hrdlicka, Archeological Institute; R. Zon, Society of Foresters; E. F. Wendt, Society of Engineers; P. G. Agnew, Institute of Electrical Engineers.

Dr. Charles V. Norris, Chief of the Pathological Laboratories of Bellevue Hospital, has been appointed by Mayor Hylan to be chief medical examiner for New York City.

Dr. L. C. Glenn, of Vanderbilt University, has been made acting state geologist on the Tennessee Geological Survey until a successor to the late Dr. A. H. Purdue can be secured. Dr. J. I. D. Hinds, of Lebanon, has been appointed chemist of the Tennessee survey. A short time before the death of Dr. Purdue, he asked Dr. Hinds to take this position as successor of Dr. Paul C. Bowers, who had been called to Washington for government service, and he has been in charge of the state work since December 10.

Major Grayson M. P. Murphy, of New York, has resigned as head of the American Red Cross Commission to Europe. It is reported that he will return to service in the U. S. Army. Major James W. Perkins of New York, who has been serving with the

American Red Cross Commission in Europe since last June, will immediately take up the direction of the commission's work.

DR. H. L. RUSSELL, dean of the College of Agriculture of the University of Wisconsin, has been granted leave of absence by the university, at request of Mr. Herbert Hoover, U. S. Food Administrator. Dr. Russell will organize the Section of Agricultural Relations which will connect the work of the Food Administration and the U. S. Department of Agriculture along production lines and present the work of the administration to the extension agencies of the agricultural colleges.

THE Food Adminstration has requested and secured from the New York Agricultural Experiment Station, leave of absence for F. H. Hall, vice director and editor of that institution, in order that he may take charge of the publicity work of the Food Administration dealing with perishable foods.

THE following members of the faculties of Harvard University have been granted leave of absence: Albert Sauveur, professor of metallurgy and metallography, who is to continue his research work for the French government; Reginald A. Daly, Sturgis-Hooper professor of geology, who is to take up Y. M. C. A. work; Julian L. Coolidge, assistant professor of mathematics, who has been commissioned a major in the Ordnance Department; Lester R. Ford, instructor in actuarial mathematics, who is to enter the military service; Samuel W. Ellsworth, assistant in roentgenology, who has been commissioned captain in the Medical Reserve Corps.

CHARLES A. KOFOID, professor of zoology, University of California, has been appointed major in the Sanitary Corps of the U. S. Army.

DR. GEORGE A. SOPER, consulting sanitary engineer in New York City, has been appointed major in the Sanitary Corps of the National Army.

DR. WALTER R. PARKER has been granted leave of absence from the professorship of ophthalmology in the medical school of the University of Michigan, to accept service as major in the Medical Reserve Corps.

ASSOCIATE PROFESSOR J. C. RILEY, of the department of mechanical engineering of the Massachusetts Institute of Technology, has been given the commission of major in the Signal Corps.

PROFESSOR STERLING TEMPLE, of the department of chemistry of the University of Minnesota, has gone to Washington where he is to engage in work as a civilian in the ordnance department.

LEAVE of absence has been granted to Professor David L. Webster, of the department of physics of the University of Michigan, to enable him to accept a first lieutenancy to do research work on aviation instruments.

LEAVE of absence has been granted to Lewis Knudson, professor of botany in the college of agriculture of Cornell University, till next September, to permit him to engage in Y. M. C. A. war work in France.

DR. WILLIAM S. THAYER, of the Johns Hopkins Medical School, has returned to the United States after four months in Russia, as a member of the mission sent by the American Red Cross.

DR. H. GIDEON WELLS, of the University of Chicago, has returned from Roumania to which country he was sent as a member of the American Red Cross Mission.

PROFESSOR E. V. MCCOLLUM, head of the department of chemistry of the school of hygiene and public health of the Johns Hopkins University, will deliver the Packard lecture before the American Pediatric and Rush societies of Philadelphia on February 12. The subject of the lecture is "Growth."

A HARVEY SOCIETY lecture will be delivered at the New York Academy of Medicine on February 9 by Professor John Gordon Wilson, of Chicago. The subject is "The effect of high explosives on the ear."

DR. FRANK R. VAN HORN, professor of geology and mineralogy at the Case School of Applied Science, in Cleveland, lectured on January 22, on "Some geological features of

Alaska and the Yukon" before the faculty and students of Purdue University.

At the annual meeting of the Royal Microscopical Society Mr. E. Heron-Allen delivered his presidential address on the society during the great war and after.

A course of public lectures on some biological problems of to-day is being given at University College, London, during January and February as follows: On the problem of food, by Professor W. M. Bayliss, F.R.S., on January 21; on war bread and its constituents, by Professor F. G. Hopkins, F.R.S., on January 28; on accessory food factors (vitamines) in war diets, by Miss E. Margaret Hume, of the Lister Institute, on February 4; and on alcoholic and other beverages, by Professor Cushny, on February 11.

The lecture arrangements of the Royal College of Surgeons of England for February are as follows: February 6, on the surgical treatment of neuralgia, by Mr. Jonathan Hutchinson; February 8, on the treatment of war injuries of the jaw and face, by Mr. Percival P. Cole; February 11, on the diagnosis and treatment of syphilis of the central nervous system, by Dr. Hildred Carlill; February 13 and 15, on the Quaderni d'Anatomia by Leonardo da Vinci, by Professor William Wright; February 18, on the structure of the English skull, by Mr. F. G. Parsons; February 20 and 22, on projectile fracture of limb bones, by Mr. E. K. Martin, and February 25, on the pathological aspect of certain war injuries of the eye, by Colonel W. T. Lister, C.M.G.

On February 28, 1918, The American Museum of Natural History in cooperation with the delegates from the New York Academy of Sciences, Section E of the American Association for the Advancement of Science and the New York Mineralogical Club, will hold a memorial meeting at The American Museum of Natural History in honor of Abbé René Justus Hauy, 1743–1822, the great French crystallographer. Papers are expected from Edgar T. Wherry, Edward H. Kraus, George F. Kunz and others, and one written for the celebration by the late L. P. Gratacap will be read. Portraits of Abbé Hauy and the Hauy Frères, as well as mineralogical books of the eighteenth and nineteenth centuries will be shown. Dr. George F. Kunz, 405 Fifth Avenue, New York City, is chairman, and Dr. Herbert P. Whitlock, the New York State Museum, Albany, N. Y., is secretary of the committee of arrangements.

The following resolution on the death of Dr. Theodore Janeway, has been adopted by the General Medical Board of the Council of National Defense:

The general medical board of the advisory commission of the Council of National Defense desires to place on record its profound sense of loss in the death of one of its most active and useful members, Dr. Theodore Janeway, professor of medicine in the Johns Hopkins University, of Baltimore. In this loss it shares with the entire medical profession, from which has been taken one of its chief ornaments. Dr. Janeway has rendered conspicuous service to the country by his devoted and successful efforts in the Surgeon General's office in aiding in the selection of the medical personnel of the Army hospitals. He has died as truly in the service of his country as if on the field of battle.

On Tuesday evening, January 29, a seminary in Stimson Hall, Cornell University, was devoted to an appreciation of Dr. F. P. Mall, for his work in advancing anatomical science, and for the training and encouragement he gave to young men and women who are in the medical and teaching professions.

Rollin A. Harris, since 1890 mathematician to the U. S. Coast and Geodetic Survey, died suddenly on January 17, aged fifty-four years.

Professor Charlotte Fitch Roberts, Ph.D., since 1894 head of the department of chemistry at Wellesley College, died in her fifty-eighth year, after a very brief illness, on December 5, 1917. A correspondent writes: "Through earnest and effective teaching she has, through her contact with a very large number of pupils, rendered a real service to chemistry. The loss of her genial companionship is keenly felt by a large circle of friends."

Dr. W. L. Purves, a distinguished English aural surgeon, has died at the age of seventy-five years.

PLANS have been perfected and the contracts let for converting the Billings estate on Washington Heights, New York City, into a war hospital. This property, comprising fifty-seven acres of land, was purchased about a year ago by John D. Rockefeller, Jr., with the idea of eventually giving it to the city for a park. The plans for the war hospital call for the expenditure of $500,000 for remodeling the buildings already on the property and the erection of additional buildings necessary to the completion of a hospital system.

THE new museum of Santa Fe, New Mexico, according to the *American Museum Journal,* has been dedicated with ceremonies extending from November 24 to 28. The building is patterned after the old Mission Church on the Rock of Acoma, in a style of architecture said to be one hundred and fifty years older than the California missions. A feature of the dedication was an exhibition of paintings by well-known members of the Santa Fé and Taos artist groups, including Robert Henri, E. J. Couse, J. H. Sharp, Walter Ufer and others, on subjects inspired by Indian, Spanish and frontier lore, and consisted of addresses, concerts, Indian dances and excursions to Indian pueblos and ancient cliff dwellings. The American Museum was represented by Dr. Clark Wissler, curator of the department of anthropology, who gave an address on "The Opportunities of the New Museum," and by Mr. N. C. Nelson, who spoke on "Recent Archeological Discoveries in the Southwest."

UNIVERSITY AND EDUCATIONAL NEWS

FIVE members of the present University of North Carolina faculty have been appointed by the trustees Kenan professors, under the provision in the bequest of Mrs. Robert W. Bingham (Mary Lily Kenan) made public last August. They were chosen by vote of the faculty because of distinguished service rendered in the field of scholarship and university affairs. They are Professor Francis P. Venable, of the department of chemistry; Professor H. V. P. Wilson, of the department of zoology; Professor Edwin Greenlaw, of the English department; Professor William Cain, of the mathematics department, and Professor W. deB. MacNider, of the school of medicine. The Bingham bequest was made for the purpose of strengthening the faculty of the university, an annual sum of $75,000 being proided for the purpose of augmenting aid received from the state.

COLUMBIA UNIVERSITY plans a large diagnostic clinic for the people who do not wish to accept charity and who are unable to pay for the services of a number of experts whose special advice or examinations may be needed in order to make a diagnosis. The financial arrangement provides that every clinical worker will be paid for his work and every patient charged a fee commensurate with his income.

THE University of Maryland, by a recent ruling of the faculty, beginning the next October term, will accept women students in the medical department. This ruling admits women to every department of the university, as they have been accepted in the dental, pharmacy and law departments for some time.

As Padua has recently been the objective of Austrian air raiders, the rectorate and academic council of the university have been by official decree transferred temporarily to Pisa. The same decree authorized the minister of education to allow professors of Padua to lecture in other universities and superior institutions.

AT the Massachusetts Institute of Technology William F. Jones has been appointed instructor in geology, Royal E. Grant, instructor in physics, C. H. G. Gray, assistant in electrical engineering and Dr. F. H. Thorp, lecturer in industrial chemistry.

DISCUSSION AND CORRESPONDENCE

CYCADEOID WOOD STRUCTURE

IN a recent communication in the *Annals of Botany* describing certain Cycadeoid rootlets Dr. Marie C. Stopes remarked the presence of scalariform structures. These are in agreement, of course, with the main body of secondary wood, which in the Cycadeoids is uni-

formly scalariform instead of pitted as in the Cycads. Dr. Stopes then takes issue with the opinion expressed in the well-known text-book of Scott to the effect that [in Cycadeoids]

> the histological details of both wood and bast agree precisely with the corresponding structures in a recent cycad.

It is even stated that no plants agree with the Cycadeoids. In the case of long-known structures represented by such profuse material as the groups referred to, botanists should be able to agree more closely as to the facts.

The point involved is that while these groups agree in their general structures and present many points of histologic contact, neither is without singularities of its own. Chamberlain makes essentially the same statement as Dr. Scott. And I see no final reason for disagreement. The old cryptogamic wood is in the Cycads as completely lost as in the later Cordaiteans, but next the pith both the existing and fossil Cycads are in very essential agreement; and in both the passage from scalariform to pitted wood is the same. Perhaps the two groups might be considered divergent histologically were it not for the fact that *Stangeria* like the Cycadeoids is an essentially scalariform type and thus forms a connecting link on the one hand; while on the other, *Cycadeoidea micromyela* has pitted wood near the cambium layer.

The differences observed are therefore not so great as they at first sight appear. And such differences are found moreover in existing dicotyls. Thus in *Trochodendron,* which has pronounced growth rings, the spring wood presents the same scalariform type as the wood of the Cycadeoids; while in the related *Drimys* with rather suppressed growth rings the main body of wood is as strikingly pitted as in Cycads or *Araucaria.* The explanation is obvious when the seedling of *Drimys* is studied. There is the same transition from the scalariform to the pitted wood as in the existing and fossil Cycads. It may be remarked incidentally that were the stems of *Trochodendron* and *Drimys,* as well as other Magnoliaceæ, divested of their radial storage tissue the agreement with both the Cycads and Cycadeoids would be a striking one indeed. It is easy, however, to look upon this storage tissue as a comparatively modern structure. There is a definite suggestion that medullar reduction and profuse branching are in some way correlated with the development of thick-walled storage tissue by dicotyls. It is not necessary to enter further upon this topic at this time; but it is evident that the facts fully sustain Scott's simple form of statement as to the agreement histologically of the Cycad and Cycadeoid woods as based partly on the study of Solms and myself.

G. R. Wieland

Yale University

THE RELATION BETWEEN AGE AND AREA IN THE DISTRIBUTION OF PLANTS

In a discussion of the "Age and Area" hypothesis of Professor Willis, by E. W. Sinnott, in Science for November 9, 1917, the author very justly sets out with the contention that "other factors than age share in the area occupied by a species." Factors inherent in the plant itself, he tells us, such as hardiness, adaptability, growth habit and the like, play a very important part in determining distribution.

As a notable illustration in support of this statement, I would call attention to the rapid dispersion of a comparatively recent immigrant, the Japan honeysuckle (*Lonicera Japonica*) which now occupies a wider area in our southeastern states than the longleaf pine, and others of our "oldest inhabitants." My first recollection of this plant goes back to that now almost prehistoric time, vaguely recorded in the popular mind as "before the (civil) war," when it was known only as a garden plant. It continued in favor as an ornamental vine for piazzas and pergolas for a decade or so later, until it began to "run wild" at such a rate that it fell into disrepute for ornamental purposes, and is now the most aggressive and indomitable enemy with which our native plant population has to contend. Unlike the common herbaceous weeds of cultivation, it does not confine itself to roadsides and waste places, but invades the most secluded haunts of the wild flowers, strangling

or smothering under its rank foliage every green thing that stands in its way. It is no uncommon thing to see whole acres of haw thickets and other shrubby growth enveloped in its deadly meshes, and destined to slow extermination by this ruthless invader. Among its victims I have seen a remarkably fine specimen of "tree haw" (*Cratægus viridis*) 4 dm. in diameter, 12 m., more or less, in height, and about the same in spread of crown, reduced to little more than a mere leafless skeleton under the throttling grasp of its oppressor. So closely was it enveloped in the meshes of the woody twiner, that I had to cut my way through them with a hatchet in order to take the measurements given above.

While it prefers a rich, moist soil, as most plants do when they have the choice, this aggressive intruder can accommodate itself to almost any conditions, trailing like an humble creeper along the barren slopes of arid hillsides, rambling over wire fences along the borders of dusty roads, from the cool slopes on the plateau of Lookout Mountain, to the deepest ravines in the valley, and onward, over the granite hills of the Piedmont region, it has made itself at home. I could supplement this case with some equally striking instances of the rapid distribution of herbaceous plants, but it seems to me that the example of a shrubby species which, in spite of the fact that these are, in general, much less efficient travelers than herbs, has been able to naturalize itself, within the memory of people now living, over an area extending from the Gulf of Mexico to the estuary of the Hudson, and for a thousand miles up the great Appalachian Valley, may be taken as sufficient evidence that other factors than time influence the distribution of species over a given area.

E. F. ANDREWS
ROME, GA.

ORIGIN AND DEVELOPMENT OF THE PHOTOGENIC ORGANS OF PHOTURIS PENSYLVANICA

THERE are at present three conflicting views regarding the origin of the photogenic organs in insects. One view is that they are modified hypodermal cells, another that they are formed from both ectoderm and mesoderm, and lastly, that they are mesodermal, being derived from fat cells. Of these three views that of the fat-cell origin has been the most generally accepted. Moreover, recently two important papers have appeared which apparently definitely settle the question in favor of the theory of fat cell origin. The first of these was by Vogel ('12), who worked on the embryology of *Lanopyris noctiluca*, the other by Williams ('16), based on a study of the embryology of our native species *Photuris pensylvanica*.

Unaware of Williams's work, I had undertaken, at the suggestion of Dr. W. A. Riley, a study of the embryonic development of the photogenic organs of *Photuris pensylvanica*.

During the summer of 1916, the eggs of this species required, on an average, 26 days to complete their development.

These eggs cut in sagittal sections 3 microns thick, showed in the fourteen-day embryos that the hypodermis on the ventrolateral portion of each side of the eighth abdominal segment, in its anterior region, was definitely thickened, due to proliferation and enlargement of its cells.

In the fifteen-day embryos the organ appeared as a distinct nodule which projected from the inner surface, though at this stage there was no evidence of any separation from the hypodermis. Further, it was found that there was no evidence of any relation between the fat cells and those of the nodule, in this, or the fourteen-day embryos.

In the sixteen- to seventeen-day embryos the organ is completely separated from the hypodermis, except at its two ends, where it remains attached. From Vogel and Williams's descriptions of the earliest condition of the light organ that they observed, one would be led to believe that it was the study of this stage of development, on which they based their conclusions regarding its origin. At this time the fat cells lie in rather close proximity to those of the light organ and somewhat resemble them.

In embryos nineteen to twenty days old, there occurs a differentiation of the cells of

the photogenic organ, by which the two layers are formed. About this time the tracheal and nerve connections become fully established. At the age of twenty-two days the organ begins to emit light.

In this connection it may be stated that my observations confirm Dahlgren's recent announcement that the adult organs in the pupa arise from the hypodermis.

Walter N. Hess
Cornell University

JOSEPH YOUNG BERGEN

To the Editor of Science: In my paper in memory of Joseph Young Bergen, which appeared in Science, January 4, 1918, I stated that he was the son of a clergyman. I am now informed by Mrs. Bergen that this statement is incorrect.

Edwin H. Hall
Cambridge, Mass.,
January 30, 1918

SCIENTIFIC BOOKS

The Casting-Counter and the Counting-Board. A Chapter in the History of Numismatics and Early Arithmetic. By Francis Pierrepont Barnard. Oxford. At the Clarendon Press. 1916. 357 pp. + LXIII. plates. Price £3 3s.

When we consider the rôle played by the abacus in the history of calculation, first as the primitive and probably prehistoric dust board and finally in the form of the elaborate reckoning machines of the present day, we can see that the history of mechanical computation is closely tied up with the history of the race. It is true that for long periods we have no reference to such a device as the abacus, but for equally long periods we have no reference to many of the common customs of life and to the everyday implements used in the home. It is probable that one would have to search long in the written records of the early periods to find any reference to such homely words as button or shoestring, or to such common actions as the combing of the hair, the milking of a cow or a goat, the cooking of a piece of beef, or the making of a sandal or a shoe, and yet all these words and actions have been commonplaces for thousands of years. The recording of the use of common devices is generally inversely proportional to the frequency of their use, and this is probably one reason why the abacus, in one form or another, is not more frequently mentioned in the chronicles of various peoples.

There were three standard forms of the abacus in ancient times, the dust board, which was the forerunner of the wax tablet as the latter was of the slate; the board on which counters or small disks were moved about, these counters appearing in Rome as pebbles or marbles (calculi); and the bead abacus, the counters running in grooves or on wires, a form still found in schools in our country and familiar as the Chinese *suanpan,* the Japanese *soroban,* and the Russian *tschotü* or the Armenian *choreb.*

Of these various forms, the most interesting for the general reader of the Western World is the board on which calculi were moved, since these counters are so often mentioned in our literature. Adelhard of Bath (c.1120) speaks of such a table, saying that "quidem mensam pithogoream ob magistri sui reuerentiam. sed postī tamē abacum dixerunt," having probably in mind a passage from Boethius: "Pythagorici vero . . . mensam Pythagoream nominabant . . . a posteribus apellabatur abacus." We find the name of *abacisti* given to those who were skilled in computation with the counters, and even the verb "to abacus" is occasionally found, as in a certain manuscript of the eleventh century—"Hoc si abacizando probaveris." In later times the references to counters become very numerous. So we have in English such expressions as "Sitte doun and take countures rounde," "A nest of cowntouris," "The kitchin clarke . . . jangling his counters," "A counter caster," "Any that can but cast with Counters," and "I shall reken it syxe tymes by aulgorisme or you can caste it ones by counters." From the use of the word as representing a disk we also find it employed to represent the person, as in the expression, "Ther is no countere nor clerke con hem recken alle," and also to repre-

sent the table, as in the expression "Thogh Argus (that is, al-Khowarizmi) the noble covnter Sete to rekene in hys counter." The story is connected with Fitz-Neal's "*Dialogus de Scaccario*" of 1178 and the court of the exchequer, with backgammon, and with divers other ramifications. The counter went by various names, such as Rechenpfennig, Zahlpfennig, and Raitpfennig in Germany; projectiles and abaculi as well as calculi in Latin; jetons, gectz, getoirs, giets, and the like in France; Leggelt and Werpgeld in Holland; and jettons and Venetian money as well as counters in England.

It is the field of counters that Professor Barnard has made his own in the monumental and sumptuous work under review. For many years he has been collecting specimens of counters of the various European countries. He has examined upwards of 40,000 specimens and has in his own cabinet some 7,000, most of those described being in this collection. With great care he has selected typical specimens, the choice being determined by their historical importance, artistic merit and general value. Fifty-nine Early English jettons are described, nineteen Italian, three hundred seventy-two French, ninety Low Country, one hundred twenty-two German, and four Portuguese. Each specimen is illustrated photographically and each is described with all the care of a trained numismatist. Nothing could be more satisfactory to the collector or the student, and it would be difficult to suggest a single particular in which the descriptive material could be improved.

To the historian of mathematics one of the items of greatest value is the set of photographs of reckoning tables at Basle and Nürnberg, of reckoning cloths at Munich, of illustrations from manuscripts and early printed books, and of Dutch jetton cylinders, together with a description of each. There is also a valuable list of one hundred fifty-nine extracts from English inventories with references to counting boards, thus showing that these devices were common from the fourteenth to the sixteenth century at least. The first two of these extracts, of date 1321 and 1337, respectively, make mention of "Camera quædam cum mensa quadrata ad calculandum" and of "Unum computatorium," while other interesting items refer to "the cheker," "counting-bord," "unum scaccarium," "cowntynge borde or table," "accomptyng borde," "unam mensam vocatam a counter," and "the counterborde in the Hall."

Perhaps the most important part of the work from the standpoint of the historian is that on "the methods of casting with jettons" (pages 254–319). Here Professor Barnard has given a very satisfactory summary of the more important European works on the subject, such as those by Recorde, Awdeley, Reisch, Cusanus, Siliceus, Köbel, de Moya, and Trenchant. There should also be mentioned as of great value to students the bibliography of upwards of six hundred titles.

Taken as a whole the work may be safely characterized in superlatives. Such an elaborate treatise on any special field of the history of mathematics has never before appeared, nor are we likely soon to see another. The infinite pains taken by the author in his research, the munificence shown in the publication itself, and the fact that a mass of technical material is presented in a style that makes every page readable, all combine to render the work unique in its way. No library of reference can afford to be without the book, and students of the history of mathematics should add it to their personal libraries as soon as they can arrange to do so. It will be the classic upon the subject for generations to come.

DAVID EUGENE SMITH

The Nature of Solution. By HARRY C. JONES. New York, D. Van Nostrand Co. 1917. 23 x 15 cm.; pp. xxiv + 380.

The present work is not a text-book, but a general discussion of some of the more important properties of solutions, true and colloidal. It is therefore written in a non-mathematical, indeed, largely in a semi-popular style. It is hoped that this work may interest students of the various branches of science to go on into the real physical

chemistry of solutions, and from this into physical chemistry in its broadest sense.

As far back as 1893 Jones did some work with Arrhenius on the hydrates of sulphuric acid. In 1900 he suggested that part of the abnormal changes of the freezing-point with concentrated solutions is due to the solute forming a compound or solvate with the solvent, so that the real concentration is or may be much greater than the apparent concentration. From this time on Jones devoted practically all his time to a study of solvates in solution. The results are remarkable in quantity and in range. Jones points out, p. 346, that "the following sixteen lines of evidence bearing on the solvate theory of solution have been established:

"1. Relation between lowering of the freezing-point of water and water of crystallization of the dissolved substance.

"2. Approximate composition of the hydrates formed by various substances in solution.

"3. Relation between the minima in the freezing-point curves and the minima in the boiling-point curves.

"4. Relation between water of crystallization and temperature of crystallization.

"5. Hydrate theory in aqueous solutions becomes the solvate theory in general.

"6. Temperature coefficients of conductivity and hydration.

"7. Relation between hydration of the ions and their volumes.

"8. Hydration of the ions and the velocities which they move.

"9. Dissociation as measured by the freezing-point method and by the conductivity method.

"10. Effect of one salt with hydrating power on the hydrates formed by a second salt in the same solution.

"11. Investigations in mixed solvents.

"12. Spectroscopic evidence bearing on the solvate theory of solution; work of Jones and Uhler.

"13. Work of Jones and Anderson on absorption spectra, in which the presence of 'solvate' bands was first detected. This showed that the solvate had an effect on the absorption of light, and this could be explained only as due to a combination between the solvent and the resonator, or something containing the resonator.

"14. The work of Jones and Strong on absorption spectra established the existence of a large number of 'solvent' bands. They showed that these were formed by many salts and in many solvents. They could even distinguish between the bands of a salt in a given alcohol and in its isomer. This was regarded as very important. The temperature work of Jones and Strong was strong evidence for the solvate theory.

"15. The work of Jones and Guy on the effect of high temperature on the absorption spectra of aqueous solutions, and also on the effect of dilution, led to results which were also in keeping with the solvate theory. The most important work of Jones and Guy which bears on the solvate theory of solution is that in which the radiomicrometer was used. It was here shown that solutions of certain strongly hydrated non-absorbing salts are more transparent than pure water having a depth equal to that of the water in the solution. In the case of non-hydrated salts the solution was the more opaque. This shows that water in combination with the dissolved substance—water of hydration—has less absorption than pure water. This is regarded as striking evidence that some of the water in the presence of salts which are shown by other methods to hydrate is different from pure, free, uncombined water; and the simplest explanation seems to be that this is the combined water or water of hydration.

"16. The work of Jones and Guy was repeated and extended by Jones, Shaeffer and Pauls. They obtained results of the same general character as those

found by Jones and Guy. Solutions of hydrated salts were in general more transparent than pure water, especially at the centers of the absorption bands. Solutions of non-hydrated or only slightly hydrated salts are more opaque than pure water, especially at the centers of the bands."

The quantitative conclusions are based on the two assumptions that the van't Hoff formula holds absolutely when the true concentrations are used, and that the percentage dissociation can be calculated from the conductivity. Unfortunately, neither of these assumptions is true. There are many who think very highly of Jones' work and there are those who are more critical. All will agree, however, with the words of Professor Reid in the biographical sketch, that Jones was an advocate rather than a judge. WILDER D. BANCROFT

SPECIAL ARTICLES

COMPARATIVE PERMEABILITY OF FERTILIZED AND UNFERTILIZED EGGS TO WATER

IN general the rate of the osmotic entrance or exit of water, in any living cell, after transfer from its normal medium to another non-injurious medium (*i. e.*, one not impairing semi-permeability) of lower or higher osmotic pressure, varies directly (1) with the gradient of osmotic pressure between the interior and the exterior of the cell, (2) with the area of the semi-permeable membrane enclosing the cell, and (3) with the permeability of this membrane to water. It is to be expected that this permeability to water will vary in different physiological states of the cell; and that the same species of cell, placed in the same medium, will show variations in the rate of the osmotic transfer of water, *i. e.*, in its rate of swelling or shrinkage, according to its physiological condition or state of functional activity at the time of the transfer. There is in fact a definite and constant difference between the fertilized and the unfertilized eggs of the sea-urchin *Arbacia* in this respect, fertilization being followed regularly by a marked increase in the permeability of the egg-surface to water—as may readily be shown by bringing the eggs into either dilute or concentrated sea-water; in the former medium they swell, in the latter they shrink, but in both cases the rate of the process is much greater in the fertilized than in the unfertilized eggs. In the unfertilized eggs both swelling and shrinkage are surprisingly slow, so that in a medium whose osmotic pressure differs from the normal by so much as ten or twelve atmospheres these eggs show little apparent alteration of size at a time (*e. g.*, two minutes after placing in this medium) when the fertilized eggs are conspicuously swollen or shrunken. This difference of behavior relates entirely to the *rate* at which water either enters or leaves the egg; the *degree* of swelling or shrinkage when osmotic equilibrium is reached is approximately the same in both cases. It is clear therefore that this difference has nothing to do with any possible change in the osmotic pressure of the egg-protoplasm, resulting from fertilization, but is determined simply by the greater readiness with which water enters or leaves the fertilized as compared with the unfertilized egg. According to former measurements made on the rate of swelling of fertilized and unfertilized eggs in dilute sea-water, the resistance to the passage of water across the plasma-membrane is decreased approximately four times as a result of fertilization.[1]

The most striking and convenient method of showing this difference is to place a mixture of equal numbers of unfertilized and fertilized uncleaved eggs (the latter fertilized at least 15 minutes previously) in a somewhat strongly hypertonic sea-water (*e. g.*, 1 volume of van't Hoff's artificial sea-water of 2.5 m concentration *plus* 4 volumes normal sea-water). The fertilized eggs at once shrink rapidly and undergo crenation, and within less than one minute exhibit a collapsed, shrunken, and angular appearance; at this time the unfertilized eggs show little change, so that a striking contrast is presented. Shrinkage continues slowly in the unfertilized eggs, and becomes well marked in the course of five or six minutes, but a curious

[1] *Amer. Jour. Physiol.*, 1916, Vol. 40, p. 249.

difference is that the eggs remain smooth and spherical during the entire period of shrinkage, the surface showing none of the folds and crenations so characteristic of the fertilized eggs. Evidently the properties of the plasma-membrane have undergone profound changes during fertilization, so that by the above simple osmotic method the fertilized eggs are immediately and sharply differentiated from the unfertilized. One incidental effect of the rapid shrinkage of fertilized eggs (which involves a corresponding increase in density) is that they sink at first in the hypertonic sea-water more rapidly than unfertilized eggs; and in fact a partial separation of the two kinds can readily be accomplished in a test-tube or graduate by taking advantage of this difference in the rate of sinking.

Shrinkage, if not too pronounced, has little or no injurious effect upon the eggs, and fertilized eggs after return to sea-water continue their development. The osmotic properties of the plasma-membranes are apparently unaffected by the process of shrinkage. If mixed eggs that have been well shrunken by exposure to the above hypertonic sea-water for five minutes are returned to normal sea-water, it is observed that the fertilized eggs regain their normal water-content much more rapidly than the unfertilized; after a minute in the normal sea-water they are distinctly the larger of the two. Later, as the unfertilized eggs also approach osmotic equilibrium this difference disappears.

Experiments similar to the above were also performed with the fertilized and unfertilized eggs of the sand-dollar, *Echinarachnius parma*. These eggs were found similar to those of *Arbacia* in their behavior in dilute and concentrated sea-water.

Artificial membrane-formation by treatment with butyric acid produces the same kind of change as normal fertilization in the osmotic properties of *Arbacia* eggs, but the degree of the effect is much more variable. It was interesting to find that the rate of shrinkage in hypertonic sea-water shows a definite correlation with the character of the membrane separated from the egg; when this is well separated and sharply defined in appearance the rate of shrinkage, the crenation, and the other features of the behavior approach closely those of sperm-fertilized eggs; on the other hand, eggs with poorly formed membranes show more gradual shrinkage and relatively little crenation; while eggs which show little or no indication of membrane-formation (some of which are always present) show the slow shrinkage and lack of crenation characteristic of unfertilized eggs. Such gradations of behavior, indicating gradations in the degree to which permeability has been increased by the treatment, are always found. This variability is probably correlated with the variability in the developmental capacity of artificially activated *Arbacia* eggs, which typically yield only a small proportion of normal larvæ.

The above change in the properties of the plasma-membrane does not take place suddenly, but begins gradually and requires about 20 minutes after fertilization (at 20°–22°) to reach an approximate final stage. The change is thus progressive and continues long after the separation of the fertilization-membrane. At five or six minutes after insemination there is little apparent difference from unfertilized eggs, *i. e.*, the eggs shrink slowly in hypertonic sea-water and do not crenate; at nine or ten minutes shrinkage is considerably more rapid and there is some crenation; at thirteen to fourteen minutes the majority show well-marked crenation within one minute; at twenty minutes both rate of shrinkage and degree of crenation are still further increased, although the maximum is not reached until considerably later. It is evident that some special process is initiated by the spermatozoon, having the effect of changing the properties of the plasma-membrane in the direction of increased permeability to water and increased liability to crenation.

The intimate nature of this process can not be defined clearly at present, but it was found to be checked or arrested, reversibly, by anesthetics or high concentrations of cyanide.

Eggs placed within two or three minutes after insemination in sea-water containing the following anesthetics were found to retain the condition of low water-permeability (the state characteristic of unfertilized eggs) during the period of exposure to the anesthetic, *e. g.*, 30 minutes or more; if they were then brought back into normal sea-water the permeability underwent the usual increase and development continued. Chloral hydrate, chloroform, alcohols (methyl, ethyl, propyl, isobutyl, i-amyl). ethyl urethane, ether, all show this effect in appropriate concentrations, which are approximately the same as those required for anesthetizing the cleavage-process. It is clear therefore that the permeability-increasing phase of the activation-process, after it has once started, may be temporarily inhibited by anesthetization. Potassium cyanide has a similar effect, but only in relatively high concentrations (above *n*/200, with some slight effect at *n*/400); in lower concentrations, *e. g.*, *n*/1,000 (which is many times greater than that required to arrest cleavage completely), no evident effect was observed. It is probable that the anesthetics inhibit the permeability-increasing process by a different kind of influence from that exerted by cyanide.

RALPH S. LILLIE

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THE AMERICAN SOCIETY OF NATURALISTS

THE thirty-fifth annual meeting of the American Society of Naturalists was held in the Carnegie Museum, Pittsburgh, January 1, 1918. In affiliation with the society this year were Section F of the American Association for the Advancement of Science and the Botanical Society of America.

The report of the treasurer, stating a balance on hand of $657.11, was accepted.

The following changes in the constitution, recommended by the executive committee, were authorized.

Article II., Section 1, the following sentence to be added: A nomination for membership in the society shall remain in the hands of the executive committee for at least one year before action is taken upon it.

By-law 2 to read: Each president on retiring shall appoint a committee of five to nominate officers and this committee shall present names for action by the society at its next annual meeting.

The following new by-law to be added: A publication committee, consisting of the three past-presidents, the secretary and the treasurer may select and arrange for the publication of papers presented before the society, provided that the society thereby is not involved in financial obligations.

It was recommended by the executive committee that the American Society of Naturalists cooperate with other biological organizations by electing two botanical members to serve on the committee on botanical abstracts, and that these members shall be nominated by the executive committee. This recommendation was adopted by the Society and the following were elected to represent the American Society of Naturalists on the committee on botanical abstracts: J. Arthur Harris (1919–20), Edward M. East (1919–22).

A resolution, as follows, framed by a committee consisting of Albert J. Blakeslee and Leon J. Cole, was adopted, and the secretary was instructed to forward a copy of it to the National Research Council.

Realizing the importance of placing all men who enter the national service where their training and abilities may be utilized to the maximum in the prosecution of the war, and in view of the experience of our allies, who at first failed to take advantage of the technical fitness of recruits for special war activities both at home and at the front and who later found it necessary to make readjustments at great loss of time and energy—be it

Resolved, That the American Society of Naturalists urge upon the National Research Council the desirability of taking such steps as may be necessary to secure the detailing to special scientific duty of men with technical training and ability who may have been called to military service, but who are found essential to scientific activities of the war.

There were elected to membership: Ethan A. Andrews, Johns Hopkins University; Ernest B. Babcock, University of California; Frank S. Collins, North Eastham, Mass.; Thomas H. Goodspeed, University of California; William H. Gregory, American Museum of Natural History; Heman L. Ibsen, University of Wisconsin; Karl F. Kellerman, U. S. Department of Agriculture; Vernon L. Kellogg, Stanford University; Richard S. Lull, Yale University; Robert K. Nabours, Kan-

sas Agricultural College; Charles D. Walcott, Smithsonian Institution; Charles Zeleney, University of Illinois.

On Saturday evening members of the Naturalists and of the affiliated societies attended a smoker given by the biologists of Pittsburgh at Carnegie Music Hall.

A symposium was presented in the afternoon session on the subject, *Factors of organic evolution.*

Climatic change as a factor in organic evolution, by Ellsworth Huntington. (Read by title.)

Migration as a factor in organic evolution, by C. C. Adams.

Method of reproduction as a factor in organic evolution, by E. M. East. (Read by title.)

Mutation as a factor in organic evolution, by T. H. Morgan.

Mendelian inheritance as a factor in organic evolution, by C. B. Davenport.

Natural selection as a factor in organic evolution, by J. Arthur Harris.

Disease as a factor in organic evolution, by Theobald Smith. (Read by title.)

Intelligence as a factor in organic evolution, by R. M. Yerkes. (Read by title.)

In addition to the symposium the following papers appeared upon the program:

Sex intergrades in Cladocera and their significance, by A. M. Banta.

A demonstration of the origin of two pairs of female twins from two eggs of high storage metabolism, by Oscar Riddle.

Changing the sex ratio in the rat through inbreeding, with selection, by Helen D. King. (Read by title.)

Changes in sexuality in plants, by A. B. Stout.

Mutations in Datura, by A. F. Blakeslee.

Nutritional effects influencing the development of maize hybrids, by D. F. Jones. (Read by title.)

The inheritance of variations in the marginal spines of Silvanus surinamensis, by Marian E. Hubbard. (Read by title.)

Parthenogenesis and inheritance in the grouse locust, Appotettix sp.?, by R. K. Nabours.

The rôle of approaching extinction in evolution, by L. E. Griffin.

Ticking, banding and silvering factors in cats in relation to the problem of mimicry, by P. W. Whiting.

Variations in somatic chromosome numbers, by R. T. Hance.

Eleven matings in a species with heteromorphic tetrads; recombinations expected in the F_2, by E. Eleanor Carothers. (Read by title.)

Sex-determination in a parasitic wasp, Hadrobracon brevicornis Wes., by P. W. Whiting. (Read by title.)

The influence of sex on the color pattern of guinea-pigs, by Sewall Wright.

Atrophic fetuses in yellow mice and zygotic elimination, by J. A. Detlefsen. (Read by title.)

Fluctuations of sampling in a Mendelian population in mice, by J. A. Detlefsen. (Read by title.)

On the hybridity of Entylia sinuata Fab. and its forms occurring in nature, by S. I. Kornhauser. (Read by title.)

The independence of the germplasm and soma in Thelia bimaculata Fab., by S. I. Kornhauser.

The distribution of granular pigment in the hair of guinea-pigs, by H. R. Hunt and Sewall Wright.

Histological studies on trimerous bean seedlings, by J. Arthur Harris and J. Y. Pennypacker. (Read by title.)

The rôle of factor mutations in evolution, by E. B. Babcock. (Read by title.)

The result of cousin marriages through N generations, by F. A. Spragg.

Germinal changes in the bar-eyed race of Drosophila during the course of selection for facet number, by Charles Zeleney.

The genetic and somatic relationship between vestigal and miniature wings in Drosophila melophila, by Orren Lloyd-Jones and F. S. Hultz.

The Naturalists' dinner was held on the evening of January 1 at the Hotel Schenley with fifty in attendance. The address of the president, Dr. George H. Shull, was entitled "The genotype and its environment."

The officers of the society for 1918 are:

President—William E. Castle, Harvard University.

Vice-president—Guy N. Collins, United States Department of Agriculture.

Secretary—Bradley M. Davis, University of Pennsylvania (1917–19).

Treasurer—J. Arthur Harris, Carnegie Station for Experimental Evolution (1918–20).

Additional members of the executive committee—Leon J. Cole, University of Wisconsin (1918); Frank R. Lillie, University of Chicago (1916–18); Raymond Pearl, Maine Agricultural Experiment Station (1917–19); George H. Shull, Princeton University (1918–20).

Bradley M. Davis,
Secretary for 1917